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PRE-DEFINITION PHASE Final  
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## FINAL TECHNICAL REPORT

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
AMES RESEARCH CENTER

for

"INTERDISCIPLINARY SCIENTIST WITH SIRTF"  
for

EXTENDED PRE-DEFINITION PHASE  
NASA Grant NAG 2-313

Submitted by

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## PRINCIPAL INVESTIGATOR

  
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Final Technical Report for SIRTF Work Supported By Ames  
for M. Jura's Grant as SIRTF Interdisciplinary Scientist

M. Jura has served as an interdisciplinary scientist on SIRTF since 1984. This report describes his work through December 1989 when the SIRTF project was transferred from NASA/Ames to JPL.

The main responsibility of an Interdisciplinary Scientist is to provide a broad scientific perspective on the goals and capabilities of the SIRTF mission. This is accomplished by keeping current with current research pertinent to the SIRTF mission and by maintaining a good understanding of SIRTF and contributing to its development as required.

Enclosed are a list of publications that were at least in part supported by the SIRTF funding received through NASA/Ames. These papers reflect the interest of the Principal Investigator in infrared astronomy and its usefulness in studying stars and galaxies.

During the time of this proposal, the Principal Investigator also attended the meetings of the Science Working Group and the Operations subcommittee. He assisted the Project Scientist in such tasks as writing PD-1009, the basic SIRTF science document and helped develop the Reference Mission for planning operations.

## SIRTF PUBLICATIONS—Michael Jura

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2. Hawkins, I., Jura, M., and Meyer, D. M. 1985, *Ap. J. (Letters)*, **294**, L131. "The  $^{12}\text{C}/^{13}\text{C}$  Isotope Ratio Toward  $\zeta$  Oph."
3. Jura, M. 1985, in *Circumstellar, Interstellar and Interplanetary Dust*, eds. J. Nuth and R. E. Stencel, "Observational Constraints on Circumstellar Dust", p. 3.
4. Jura, M. 1986, *Ap. J.*, **301**, 624. "Supernova Nucleosynthesis in Low Metallicity Populations"
5. Jura, M. 1986, *Ap. J.*, **303**, 327. "Mass Loss from Carbon Stars"
6. Jura, M. 1986, *Astr. J.*, **91**, 539. "Carbon Star Radial Velocities and Dark Matter in the Universe"
7. Jura, M. 1986, *Ap. J.*, **306**, 483. "Cool Interstellar Matter in Early-Type Galaxies"
8. Jura, M. 1986, *Irish Astr. J.*, **17**, 322. "The Role of Dust in Mass Loss from Late-Type Stars"
9. Jura, M. 1986, *Ap. J.*, **309**, 732. "RV Tauri Stars as Post Asymptotic Giant Branch Objects"
10. Jura, M. 1987, in *IAU Symp. No. 120, Astrochemistry* (M. S. Vardya and S. P. Tarafdar, eds.) "The Role of Dust in Circumstellar Chemistry", p. 547.
11. Jura, M. 1987, in *Polycyclic Aromatic Hydrocarbons and Astrophysics*, eds. A. Leger, L. d'Hendecourt and N. Bocca, p. 3. "Photons, Molecules and Solids in Interstellar and Circumstellar Regions: An Introduction for Non-Astronomers",
12. Jura, M. 1987, *Ap. J.*, **313**, 743. "Mass-Losing Red Giants in Open Clusters"
13. Jura, M. 1987, in *Interstellar Processes*, D. J. Hollenbach and H. A. Thronson, eds. "The Milky Way as a Galaxy", p. 3.
14. Jura, M., Kim, D. W., Knapp, G. R., and Guhathakurta, P. 1987 *Ap. J. (Letters)*, **312**, L11. "Interstellar Dust in Shapley- Ames Elliptical Galaxies"
15. Hawkins, I., and Jura, M. 1987, *Ap. J.*, **317**, 926. "The  $^{12}\text{C}/^{13}\text{C}$  Isotope Ratio of the Interstellar Medium in the Neighborhood of the Sun"
16. Claussen, M. J., Kleinmann, S. G., Joyce, R. R., and Jura, M. 1987, *Ap. J. Suppl.*, **65**, 385. "A Flux-Limited Sample of Galactic Carbon Stars".
17. Jura, M. 1987, *Proc. Astr. Soc. Pac.*, **99**, 1123. "The Relative Amounts of Stars and Interstellar Matter in the Local Milky Way".
18. Jura, M. 1988, *Ap. J. Suppl.*, **66**, 33. "Mass Loss From S Stars"
19. Jura, M. 1988, *Ap. Lett. and Communications*, **27**, 113. "SIRTF and the Search for Dark Matter in the Universe".
20. Jura, M. 1988, in *Millimetre and Submillimetre Astronomy*, R. D. Wolstencroft and W. B. Burton, eds. (Dordrecht: Kluwer) p. 189. "Mass Loss from Evolved Stars and Submillimeter Observations".
21. Jura, M., Kahane, C., and Omont, A. 1988, *Astr. Ap.*, **201**, 80. "Detection of  $^{13}\text{CO}$  Radio Emission from  $^{13}\text{C}$ -Rich Carbon Stars"
22. Kahane, C., Maizels, C., and Jura, M. 1988, *Ap. J. (Letters)*, **328**, L25. "The Bipolar

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25. Jura, M. 1989, in *Evolution of Interstellar Dust and Related Topics*, Proceedings of the International School of Physics, Enrico, Fermi, eds. A. Bonetti, J. M. Greenberg and S. Aiello (North-Holland: Amsterdam), p. 143. "Circumstellar Grains"
26. Knapp, G. R., Guhathakurta, P., Kim, D.-W., and Jura, M. 1989, *Ap. J. Suppl.*, **70**, 329. "Interstellar Matter in Early-Type Galaxies I. IRAS Flux Densities"
27. Jura, M., Joyce, R. R., and Kleinmann, S. G. 1989, *Ap. J.*, **336**, 924. "High-Luminosity Carbon Stars in the Galactic Anticenter"
28. Jura, M. 1989, in *IAU Symposium No. 106, Evolution of Peculiar Red Giants* eds. H. Johnson and B. Zuckerman (Cambridge: Cambridge University Press), p. 339. "Mass-Losing Red Giants: The Comparison Between Theory and Observations."
29. Jura, M., and Kleinmann, S. G. 1989, *Ap. J.*, **341**, 359. "Dust Enshrouded AGB Stars in the Solar Neighborhood."
30. Lazareff, B., Castets, A., Kim, D. W., and Jura, M. 1989, *Ap. J. (Letters)*, **336**, L13. "Discovery of CO Emission from NGC 1275"
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35. Jura, M. 1990, in *Windows on Galaxies*, G. Fabbiano, J. Gallagher, and A. Renzini eds. (Kluwer: Dordrecht). p. 283. "Cold Interstellar Matter in Early-Type Galaxies: A Progress Report".
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37. Jura, M. 1990, in *From Miras to Planetary Nebulae: Which Path for Stellar Evolution*, eds. M. O. Mennessier, A. Omont (Editions Frontieres: Gif sur Yvette, France), p. 41 "The Space Distribution of AGB Stars".
38. Jura, M. 1990, in press, Capri conference. "The Particles Around Mass-Losing Carbon Stars".
39. Jura, M., and Kleinmann, S. G. 1990, *Ap. J.*, in press. "Very Dusty Carbon-Rich Asymptotic Giant Branch (AGB) Stars Between  $\sim 1$  Kpc and  $\sim 2.5$  Kpc From the Sun".